

WHICH PLANET IS HE ON?

Elon Musk and the population apocalypse

EXECUTIVE SUMMARY

Since at least 2017, Elon Musk has been tweeting and speaking regularly about his concerns regarding population "collapse". Due to his high media profile and social media following, his views are widely disseminated and read. His claims are in some cases inconsistent with the existing evidence and/or expert opinion, and his opinions are open to challenge on a wide range of fronts.

- Mr Musk has claimed population "collapse" will be our "biggest issue" "in twenty years" and that it is a threat to "civilisation".
 Population is, however, currently growing and the consensus among major expert population projections is that it will continue to do so into the second half of the 21st Century. The United Nations' 2022 main projection does not foresee any significant downward trend in population before the end of the century.
- His comments suggest he considers total collapse in population is a possibility, both globally and in some major countries. Expert opinion on future population trajectories does not support this. The low ranges of the main authoritative population projections do not foresee global population falling below the levels it was at in 2000 by 2100.
- Mr Musk identifies as another potentially existential threat the substantial increase in the number and proportion of people over 65 years-old in the coming century. He is correct that it represents a substantial economic challenge but there are many policy solutions already being deployed and there is no evidence that it is a threat on that level.

- Mr Musk has dismissed immigration as a solution to low birth rates in certain countries because there will be a shortage of people everywhere. Many parts of the world will be growing their populations over the coming century. Africa alone is projected by the UN to add more than two billion people by 2100.
- Mr Musk has claimed the Earth can support many times its current population. Copious evidence and expert opinion indicates this is not the case, including that population growth is a significant driver of climate change and biodiversity loss.
- Mr Musk rarely, if at all, addresses the negative impact of high fertility and population growth on the lives of people or the economies of low income, high population growth countries. This is widely recognised as a significant challenge to the eradication of poverty and achievement of the United Nations' Sustainable Development Goals.
- Mr Musk infrequently addresses the driving factors of high population growth, which include multiple indicators of poor human wellbeing: poverty, inequality, pervasive and egregious gender inequality, low levels of health and education, and unmet need for modern contraception.

Population Matters is deeply concerned that the "population collapse" narrative promoted by Mr Musk may embolden those who seek to restrict reproductive freedoms, and divert attention from the urgent need to address the human welfare conditions and injustices which drive continued population growth. We hope for a more inclusive, nuanced and evidence-based debate, focussed on the critical issues facing everyone on what, for the foreseeable future, will remain our only planetary home.

INTRODUCTION



"Population collapse is the biggest threat to civilization"

24 May 2022 ¹ 22,000 retweets, 141,000 likes

The world's richest man has something to tell us: we are going to run out of people, it's going to happen soon and it's going to be a catastrophe. He tells us this in pithy tweets addressed to his 100 million followers and at seminars and summits, and it is all recycled in the media, reaching millions of people, everywhere. All credit to Elon Musk for having made demography a subject of public interest. The problem is that the Musk megaphone is drowning out reasoned and evidence-based debate. While doubtless even some of those who share his concerns are shifting uncomfortably in their seats over his wilder claims, no one much is challenging them. As was so often the case with Donald Trump, what's being said by the loudest voice, is becoming what's recognised as the truth.

But is it? And what are the consequences of leading people to believe that many more babies must be born?



Elon Musk's Twitter profile image, December 2021. Symbolism assumed unintentional.

Except where otherwise noted, demographic information contained in this report is from the United Nations World Population Prospects 2022².

All figures for Twitter engagement correct as of 1 July 2022.

THE END IS NIGH

"The world's population is accelerating towards collapse, but few seem to notice or care"

6 July 2017³



"The biggest issue the world will face in 20 years is population collapse."

World Artificial Intelligence Conference, 2019

Humanity took hundreds of thousands of years to reach a population of one billion, around the time of Napoleon. The second billion wasn't hit until within living memory, around the time the UK's Queen was born in the 1920s. The eight billion milestone will be hit this year, just a century later, and just eleven years after the seven billionth – the shortest gap between billions ever.



Global population is going up

It is true that the global population growth *rate* has been declining more or less continuously for 60 years. In the 1960s, the annual global rate was regularly (though not always) above 2%. Since 2020, it has been below 1%. But as long as it is above zero, the population is still growing. And, more than this, a reducing growth *rate* does not mean a reduction in the number of people added to the population each year. That's because the

population growth rate is *compound growth* (a concept the world's richest man is surely familiar with). Yes, the annual growth rate is down, but as long as population is itself growing, each year you start from a baseline of more people.

But what about that growth rate? Is the downward trend there accelerating? Perhaps. The line has been pretty steady with a few fluctuations here and there for decades now. Between 1990 and 2000, it fell from 1.75% to 1.33% and between 2010 and 2020, from 1.25% to 0.92%, but most of that change has occurred in the most recent years. But remember those fluctuations and don't make the mistake of extrapolating down at the same rate. The UN's current best estimate for when it will hit zero is in about 60 years from now.

It is also true that the total fertility rate (TFR), a measure of the amount of children an average woman may be expected to have in her lifetime, has also been falling globally, since the 1960s, when it stood at more than five. Now at 2.3, the pace of that decline has slowed, rather than accelerated in this century, but it is expected to hit the talismanic "replacement rate" of 2.1 before the century ends. Below this level, total population will, though not immediately, begin to fall. TFR is not currently, however, plummeting towards zero.



THE FUTURE

Let's get one thing clear before we dig into the numbers. No credible projection from any source sees our population being lower than it is today "in 20 years", far less collapsing. None.

The most widely recognised and used projections for population growth are those made by the United Nations Population Division (UNPD) and issued, normally, every two years. The 2022 projections are that there is a probability of 95% that the size of the global population will lie between 9.4bn and 10bn in 2050 and between 8.9bn and 12.4bn in 2100. (Reflecting the uncertainties of all the variables determining population, the further away the dates projected for are, the more uncertain the figures become, and the wider the range of probability.)

The "medium scenario", the single figure projections, are for 9.7bn in 2050, and 10.4bn in 2100. UNPD also provides for a wider range of scenarios – what would happen if the fertility rate was half-a-child per woman higher or lower than the medium scenario. These project a staggering high of 14.8bn in 2100 and a low of 7bn. 7bn was our population just 11 years ago. The UN has a pretty good track record with the medium scenario: in 1968 they projected 5.44b in 1990 – the actual figure was 5.38bn. In 2000, the population projected for 2020 was a little under 8bn.⁴ We hit 7.8bn.

In its last set of figures in 2019, UNPD projected just a one-in-four chance of global population plateauing before 2100. Responding to the evidence of growth slowing down, in 2022 it has revised its view, now envisaging a fiftyfifty chance of population peaking at some point between 2080 and 2100, and possibly declining by the end of the century. A reminder though of the level at which they expect it to plateau: 10.4bn. That's 2,400,000,000 more people than today. *Not* an acceleration towards collapse.

Musk is not buying it, however:



UN projections are utter nonsense... "

18 January 2022⁵ 2,600 replies, 41,000 likes

As we have seen, the UN's track record is far from "nonsense" and it's unclear what expertise Musk brings to make this judgement. It *is* the case that



most other extant, expert projections are, broadly, lower than the UN's. But the picture is a little more complicated than his certainty allows.

The most generally recognised and authoritative projections aside from the UN's are those produced by the International Institute of Applied Systems Analysis (IIASA) – these are used by the Intergovernmental Panel on Climate Change.

Employing a different methodology to the UN, IIASA produces a range of scenarios (Shared Socioeconomic Pathways, or SSPs) based on possible developments in factors known to influence fertility rates - primarily family planning use and education. Their most recent scenarios and projections, published in collaboration with the European Commission in 2018,6 are SSP1, 'Sustainability/Rapid Social Development' in which great progress on education, use of modern family planning and economic security leads to falling family size; SSP2, 'Continuation/medium population' which is more or less our current trajectory; and SSP3, 'Fragmentation/Stalled Social Development' in which things don't go as we hope they will.

SSP1 is strikingly lower than the UN projection, with a peak of 8.7bn, declining to 7.3bn in 2100. This is an optimistic assumption, essentially reliant on us doing better than we have done so far in things like ensuring contraception access and that more children are able to complete an education. The more likely SSP2 shows population peaking at 9.7bn around 2070 and still more than 8bn – higher than today – by the end of the century. Under SSP3, there is no peak, with population more than 13bn and still climbing in 2100.

The projections which have made the biggest splash, however, are from new kids on the block. Published in *The Lancet* in 2020,⁷ the projections of the Institute of Health Metrics and Evaluation at the University of Washington attracted dramatic headlines: the BBC spoke of a "jaw-dropping" crash⁸ in the number of births globally. Like IIASA, IHME unpacks the factors driving fertility and produces a range of scenarios. Its main projection sees population peaking at 9.7bn in 2064, then declining to 8.8 billion by the end of the century. That's a full two billion lower than the UN was projecting in 2019 – but still eight hundred million more people than we have today. Hardly a collapse.

In fact, IHME's figures up until 2060 are very similar to the UN's. Going beyond that, the difference appears dramatic – but the uncertainty of long term projections is a critical element here – at the top end of even the main scenario's "95% interval", global population in 2100 is projected to be 11.8bn – more than a billion *higher* than the UN's current medium variant projection. Its *medium* projection for a "worst case" scenario is actually higher than IIASA's – 13.6bn by the end of the century.

The IHME scenarios include lower numbers, however. In particular, it models the impact on fertility if the Sustainable Development Goals were to be met. The SDGs are the UN's framework for securing human development and planetary health by 2030 - a set of 17 areas of activity, such as Zero Hunger, Gender Equality and Climate Action, each broken down into specific targets.9 If the SDG targets related to education and contraception were achieved, IHME projects a global population in 2100 of 6.3bn - more than one billion fewer people than we have today. Sadly, as we shall see, this "if" is more representative of a theoretical possibility than a likely trajectory for human progress. Indeed, though you wouldn't know it from the headlines, a number of demographers have challenged IHME's conclusions on the basis that some of its assumptions about progress in factors driving fertility downwards are over-optimistic.10

While IIASA and IHME are the leading alternatives to the UN, in 2019 Musk placed his bet on another horse in this race: "Real issue will [be] an aging & declining world population by 2050, *not* overpopulation. Randers estimate far more accurate than UN imo"

21 June 2019¹¹

Jorgen Randers is a quite genuine prophet of ecological collapse, having been an author of the hugely influential *Limits to Growth* report¹² in 1972, which modelled future trajectories of economic activity, resource use and planetary boundaries and concluded that the then path was unsustainable. Back then, Randers predicted a global population of 13bn by 2030 but by 2012, he had revised it substantially: "The world population will never reach nine billion people... It will peak at eight billion in 2040, and then decline."¹³

The level and timing of that peak is at odds with almost every other projection of population growth, and presumably it is the source of Musk's extraordinary prediction of collapse being "our biggest issue" globally around 2040. Today though, even Randers no longer endorses it. In 2021, his projection was a peak of around 9.5bn people in 2050, and then a steep curve down to around 6bn by the end of the century¹⁴ – the same, in fact, as it was at the start of the century, just twenty-odd years ago.

In May 2022, Musk retweeted the video of him saying that that population collapse will be the biggest issue of the 2040s so presumably still holds to it. Whether he knows that Randers has changed his mind isn't known.

THE ZERO OPTION

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"If these trends continue, humanity will cease to exist" 16 June 2022¹⁵

One of the most striking aspect of Musk's contributions is that he appears to believe that there is a genuine chance of the downward trajectory hitting zero. He has spoken of civilisation *"dwindling to nothing"* and identified a couple of the potential early casualties:

"Italy will have no people if these trends continue" 24 May 2022¹⁶

"At risk of stating the obvious, unless something changes to cause the birth rate to exceed the death rate, Japan will eventually cease to exist. This would be a great loss for the world." 7 May 2022¹⁷

Here's what the UN projections say: for Italy, 59m today, 37m in 2100; for Japan, 124m today, 74m in 2100. Should those trends continue, Musk is right that we should lose both somewhere in the 24th century. Of course, his remarks are qualified with *ifs* and *unlesses* – but his sorrowful view of a permanent sunset over sushi and Suzukis suggests he considers this a possibility we must guard against. One pictures the last Japanese couple gazing into one another's eyes and deciding they'd rather go backpacking than have a child. Truly a sad face emoji moment.

Musk in many ways seems guilty of the fallacy (or rhetorical recklessness) that some population campaigners were in recent generations – assuming that if a line on a graph is pointed one way, it will simply continue to do so unless some visionary does something to stop it. These assumptions make no allowance for selfcorrection. People will always have kids. Just as humanity will not eventually be packed toe-to-toe in mile-high tower blocks eating Soylent Green, so we will not hit zero.

PASTURES NEW

There are countries facing dizzying depopulation – just not the kind that appear to have made it onto Musk's radar so far. Population is decisively falling and will fall further in a number of Eastern European countries, for instance. Fertility rates are certainly part of this picture, but not the only one. Musk's vision of planetary emigration may or may not come to pass, but people are certainly choosing to leave places on Earth for other places on Earth. For some countries, it is the number of emigrants (or refugees) that defines the crisis more than the number of babies. Moreover, because younger people are more likely to emigrate, many of those leaving are of the age at which they will start families and the "unborn emigrants" they take with them are exacerbating the downward trend.



"The common rebuttal is what about immigration. I'm like, from where?"

World Artificial Intelligence Conference, 2019¹⁸

"USA birth rate has been below min sustainable levels for ~50 years"

24 May 2022 - pinned to top of @ elonmusk Twitter page as of 2 July 2022

63,000 replies 323,000 likes

While the graph attached to Musk's hugely popular pinned tweet actually shows fertility rate, not birth rate, he is right that it has been below replacement rate for decades now. But since 1970, the US' population has grown from around 200m to 330m.²⁰ The US is founded on colonisation and has been built through immigration (forced and voluntary). In 2021, immigration drove more population growth than natural increase (births minus deaths).²¹



The emigration challenges faced by a number of countries notwithstanding, there are plenty of places with people to spare. One of the most perplexing aspects of Musk's approach is that he seems so focussed on places where fertility rates are below the replacement rate that he is not recognising (or acknowledging), the huge swathes of the world where the fertility rate is significantly above the replacement rate – sub-Saharan Africa (4.6 births per woman), Oceania excluding Australia and New Zealand (3.1) and Northern Africa and Western Asia (2.8).

Furthermore, the number of births isn't just about family size, but the number of families. Where populations are young and fertility rates high, you have lots of people of the age where they have kids, having – by the standard of global averages – lots of kids each. That phenomenon, known as demographic momentum, is why sub-Saharan Africa, with a median age of less than 18 and a total fertility rate of around 4.6 children per woman is set to add around a billion people to the global population by 2050.

So, at least one answer to the question "from where?" is not hard to identify.

Writing about Africa's future in 2022, the director of the Africa Research Institute, described Musk's population concerns as "baffling". He went on:

"The omission of African demography from Musk's pronouncement is symptomatic of colossal shortcomings in the understanding of Africa and its constituent countries in the west."²²

It is even more baffling, when one considers that Musk was born in Africa, and lived there until he was 17.

It is also important to be clear what high fertility means in Africa. In the words of the UN:

"Reducing poverty in the context of rapid population growth remains a formidable challenge. In many cases, even though poverty reduction strategies may lift large numbers of people out of poverty, the proportion of the population living below the poverty line may be stagnant or even increase. The population in many countries in sub-Saharan Africa is projected to double between 2022 and 2050, putting additional pressure on already strained resources and challenging policies aimed to reduce poverty and inequalities."²³

NOT WITH A BANG



"Let's not gradually dwindle away until civilisation ends with all of us in adult diapers, in a whimper.""

All In Summit, 17 May 2022²⁴

In 2022, almost exactly half the world's population is under 30. The UN projects that by the end of the century, half of it will still be under 40. In sub-Saharan Africa, where the median age is currently less than 18, it will not get above 30 until the 2080s.

Nevertheless, there is, of course, universal recognition that our global population is ageing. The UN projects that the share of the global population aged over 65 years will rise from 10% in 2022 to 16% in 2050. This will have increasingly significant implications for health, pensions and social care, and in some places, the economic implications threaten to be serious. If governments fail to plan for this transition, people will suffer.

But governments have known this is coming for a long time, and *are* planning for it. Nor do these plans involve transformative changes in the way we currently do things. As the UN pragmatically, and with little tone of panic, puts it:

"Countries with ageing populations should take steps to adapt public programmes to the growing proportion of older persons, including by improving the sustainability of social security and pension systems and by establishing universal health care and longterm care systems."²⁵ The economic consequences of this change are not apocalyptic. We will not run out of workers: in addition to the continuing supply of billions of young people, there is an untapped pool of labour already here. In 2018, the labour force participation rate for men globally was 75% – for women, just 49%.²⁶ Meanwhile, automation (including Musk's other concern, AI) is likely to drive down demand for workers.

Nor will pension bills overwhelm us. While the high-income, low-fertility countries of the EU are classic examples of the threat from ageing, it is estimated that the average increase in pension expenditure as a percentage of EU GDP over the next 40 years will be less than 0.2% per year.²⁷ Big, big sums in real terms, of course, but scarcely a meteor hurtling towards our economies.

Nor do people fall into decrepitude and economic dependency once over the age of 65. In the UK, for instance, the economic contribution of people over 65 was estimated in 2016/17 to be £160bn.²⁸ It is likely that in 2021 the total contribution exceeded the UK government's pension bill.²⁹ Economic dependency has actually *declined* in the UK since 1992, despite the ageing of the population.³⁰

THE GROANING PLANET

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"Most people in the world are operating under the false impression that we've got too many people. This is not true. Earth could maintain a population many times the current level."

19 April 2022³¹ 10,000 retweets, 51,000 likes

"Some people are thinking like having fewer kids is, like, better for the environment. It's just total nonsense. We're going to be fine even if we doubled the size of the humans. I know a lot about environmental stuff."

All In Summit, May 2022³²

Musk is to be lauded for his past advocacy regarding climate change, and for the contribution Tesla has made and will hopefully continue to make to addressing it. In 2017, he explicitly identified it as one of the two greatest threats to humanity,³³ but by 2019, population collapse had supplanted it in the top two. Climate change rarely comes up directly on his Twitter feed today.

Indeed, there isn't much evidence of him "knowing a lot" about environmental stuff. The biodiversity crisis is one he has scarcely addressed at all. His most significant recent comment on extinction has been that there is "100% chance" of all life on Earth becoming extinct due to the expansion of the sun "unless humanity makes life interplanetary".³⁴ (In good news for the hard– pressed engineers of SpaceX, recent research has suggested this is not a mere 150 million years away as previously thought, but about a billion.³⁵) Population is, of course, not the only driver of resource use, extinctions or climate change. How and how much humanity, and especially the richest proportion of it, has chosen to consume has driven our crisis. We can and must ease the pressure on our planet by producing and consuming less stuff, in far more sustainable ways, and ensuring that those of us who take far more than our fair share stop doing so. The critical irony is that the very places where Musk bemoans the falling birth rate are those where people have the greatest impact on the planet. A quick glance at comparative CO₂ emissions or resource use shows us that more Americans, for instance, is something the planet certainly does not need.



Source: Global Footprint Network, 2020

Technology is, of course, something Musk does talk about. It will help reduce our impact, but every essential gain that's made by ramping up battery efficiency – or eating a plant-based meal or just buying less stuff – is chasing a moving target when there are more people creating more demand. How many of us there are, and how soon and at what level population peaks is critical to the health of our planet.

Climate change

In 2022, the Intergovernmental Panel on Climate Change (IPCC) re-affirmed its consistent but remarkably under-reported diagnosis of what's driving climate change:

"Globally, Gross Domestic Product (GDP) per capita and population growth remained the strongest drivers of CO₂ emissions from fossil fuel combustion in the last decade."³⁶

CO₂ CONSUMPTION EMISSIONS PER PERSON, 2022



Unsurprisingly, we cannot keep adding people without negative impacts. The IPCC has specifically identified future high population growth as a "key impediment" to keeping warming below 1.5°C.³⁷ 2017 research, which looked at different socio-economic pathways and their energy, land use, and greenhouse gas emissions implications, found that if global population growth meets or exceeds the UN's then medium projection (10.9 billion people by 2100), avoiding more than 2°C of warming would become impossible.³⁸

Project Drawdown, which produces the worldleading analysis of 93 available policy solutions, puts a positive angle on the relationship. If, through investment in family planning and education, the UN's 2019 medium projection is met, that will save 68.9 gigatonnes of CO2 equivalent by 2050, making it the seventh most effective policy in keeping temperature increase under 1.5°C and the third most effective in keeping it below 2°C by 2100. (Drawdown estimates significantly expanded use of electric cars to save about a sixth of that amount – 9.76Gt CO2e. ³⁹)

No matter how many Teslas are made, and even if rocket launches producing hundreds of tonnes of CO₂ a time⁴⁰ were discontinued, climate change will not be "fine" if population growth does not end soon.

Biodiversity

The rather less well-known equivalent of the IPCC in the world of biodiversity is the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). In its definitive 2019 *Global Assessment*,⁴¹ IPBES found over one million species at risk of extinction. It also identified human population growth as one of the key indirect drivers of biodiversity loss, and stated "changes to the direct drivers of nature deterioration cannot be achieved without transformative change that simultaneously addresses the indirect drivers."

This is no surprise. The direct drivers of extinctions are habitat loss and fragmentation, over-exploitation (primarily for food), invasive species, pollution and climate change. We need food, and where we don't take it straight from the wild, we need land to grow it on (as well as for housing, industry and infrastructure). More than 80% of extinction threats to mammals and birds arise from agriculture.42 2017 research reviewed data on 27,600 terrestrial vertebrate species to identify the proximate causes of population extinctions and concluded that "the ultimate drivers of ... immediate causes of biotic destruction [are] human overpopulation and continued population growth, and overconsumption, especially by the rich."43

In 2021, a series of twelve studies addressed "Insectageddon" – the catastrophic loss of insects, including the pollinators who are vital to the growth of crops. One of them concluded: "To mitigate the effects of the Sixth Mass Extinction event that we have caused and are experiencing now, the following will be necessary: a stable (and almost certainly lower) human population, sustainable levels of consumption, and social justice that empowers the less wealthy people and nations of the world, where the vast majority of us live."44

Food

The World Resources Institute (WRI) estimates that due to population growth, humanity will require 56% more food by 2050⁴⁵ than was being produced in 2010. The authoritative 2019 EAT-Lancet Commission report on global food sustainability examined how to feed the human population up until 2050 without causing irreversible damage to the environment. It concluded that only a "transformation" of food production and consumption could (not would) allow a global population of 10 billion to be fed sustainably, but that even with such a transformation, feeding a population of over 10 billion without negative impacts on biodiversity and the environment is "increasingly unlikely."⁴⁶

The World Resources Institute's Creating a Sustainable Food Future, published in December 2018, was specific in including reducing human population growth in its menu of actions to ensure food sustainability. It specified the goal of achieving replacement level fertility rates by voluntary means, including "improving women's access to education and healthcare in Africa to accelerate voluntary reductions in fertility levels."⁴⁷

Water

People need water: more people, more demand for water. Drought in numbers 2022⁴⁸, from the UN Convention to Combat Desertification (UNCCD), identifies the growing severity and extent of drought. It is clear about the fundamental drivers of the crisis, stating:

"Within the next few decades, 129 countries will experience an increase in drought exposure mainly due to climate change alone – 23 primarily due to population growth and 38 mostly due to the interaction between climate change and population growth."

Ensuring everyone has enough water is not a challenge confined to where poverty and fertility rates are high. A fifth of aquifers⁴⁹ are already overdrawn, half of the world's cities⁵⁰ are experiencing water scarcity, and approximately two-thirds of the world's population⁵¹ live in areas that suffer from severe water shortage for at least one month per year. An MIT study⁵² concluded that nearly five billion people will live in water-stressed regions by 2050.

Resources and planetary boundaries

We all understand that finite resources such as oil will run out (though few of us know that sand for construction – driven largely by population growth – is on that list⁵³). The Earth also provides for our needs with renewable resources, such as timber, clean water and air, healthy soils and wild fish consumed for food. However, our demands are so great that according to the Global Footprint Network,⁵⁴ we are now using those resources at almost twice the rate that the Earth can renew them. That rate has increased continually since the 1970s and unless thing change, we will require three Earths to supply our needs by 2050.

Of course, if we curb our consumption and ensure more equitable distribution of resources, that will significantly minimise the impact. But we need to be clear about what that means. A 2018 paper in Nature Sustainability estimated⁵⁵ that, given equal usage of resources, a population of seven billion (lower than our population today) could indeed live sustainably, but only if each of us meets only our most basic needs. Economist Sir Partha Dasgupta has framed it differently: by his calculations, sustainability would only be feasible with a maximum world GDP of \$70 trillion, which if spread equally among our currently population would mean less than \$9,000 per person.⁵⁶ To put that in context, Guatemala has a per capita GDP of just under \$9,000, whereas the global average per capita GDP stands at around \$20,000, with UK citizens averaging about \$40,000. 57

So, can the Earth sustain many times its current population, and will it be "fine"? No, it couldn't. And – unless we take action – no, it won't.

PICK YOUR APOCALYPSE

Population Matters isn't qualified to evaluate Musk's concerns regarding AI, but there is a category distinction between predictions of environmental collapse and demographic "collapse". Even in Randers' speculation and IHMEs' lowest scenarios, we will have a population roughly as we had it in 2020 – and three-quarters of a century to prepare for it. Demographic change is a novel but ultimately conventional challenge that can be met by pulling traditional policy levers and readjusting some economic priorities.

In contrast, the consequences of failing to address our environmental crisis are measured in people's lives and health, in homes destroyed, farmland turned to dust, droughts, storms, heatwaves and hunger. They are measured in species and ecosystems lost that will never return. While Musk frets about Japan, some island states and coastal cities and communities across the world will literally cease to exist as a result of climate change. And those most vulnerable will suffer first, and hardest. In the words of UN Secretary General Antonio Guterres,

"The alarm bells are deafening, and the evidence is irrefutable: greenhouse gas emissions from fossil fuel burning and deforestation are choking our planet and putting billions of people at immediate risk ... We owe this [keeping within 1.5 warming] to the entire human family, especially the poorest and most vulnerable communities and nations that are the hardest hit despite being least responsible for today's climate emergency."58

While "civilisation" has not so far been shown to be dependent on a minimum number of people, conceivably some centuries down the line we may fall below that hypothetical line. But we do not *have* centuries to let that play out. Our eyes must be fixed on the real crisis of today, not the conceivable crises of the far future.

FERTILITY, FAMILY AND POPULATION IN THE REAL WORLD

High birth rates and population growth are driven by poor human wellbeing. Historically, and still today, it occurs where people are poor, where their children might not make it to adulthood, where women do not have autonomy over their own bodies, where people can't finish school and where people cannot freely access and use modern contraception. Nearing or crossing the talismanic "replacement rate" of 2.1 children per woman should be seen as a sign of human progress, not as a demographic Rubicon.

While Musk and others fret over the part of the world below 2.1, our attention should be in those parts of the world where that is still a long way off. In those places, that gap between the number of children people have and the number they want is a red flag that they are unlikely to be living the lives they deserve. Most of all, they need more choice.

All the lower projections of future population, whatever the number and whatever the source, have one thing in common – they assume more progress in human wellbeing than the higher ones. But human progress can't be assumed. As the UN put it in its 2017 projections:

"To achieve the substantial reductions in fertility projected in the medium variant, it will be essential to support continued improvements in access to reproductive health care services, including family planning, especially in the least developed countries, with a focus on enabling women and couples to achieve their desired family size."59 [Emphasis added]

How are we doing on that? Not well.

The multinational and long-term FP2020 project, intended to answer the unmet need for contraception of 120 million women by 2020, failed to meet its targets.⁶⁰ Worse than this, the absolute number of women with an unmet need is increasing. Yes, you read that right: according to researchers from the UNFPA, in 1990 230m had an unmet need, in 2020 that number was 270m and in 2072, researchers from the United Nations Population fund (UNFPA) projected, there will be two million more.⁶¹ Why? Because although we've managed to provide contraception for a higher proportion of women, population growth has outstripped that improvement.

Nor is there much progress to cheer on gender equality. Almost half of women globally still lack bodily autonomy,⁶² meaning they can't make decisions about their sexual and reproductive health and rights. Gender inequality is the strongest of all predictors of unintended pregnancy, even after controlling for the role of the human development index. Countries with higher levels of gender inequality had higher rates of unintended pregnancy in 2015–2019, in both low- to middle-income countries and highincome countries. Unfortunately, in 2020 a third of countries had made no progress or had slid backwards on women's rights since 2015.⁶³

In 2020, UNFPA calculated the sum of money needed to achieve the "three zeroes": zero unmet need for contraception, zero female genital mutilation, and zero maternal deaths. After the US\$42bn already pledged, the shortfall was US\$222bn.⁶⁴ Even Musk couldn't quite cover it all. But he could go a long way towards it.

His views on these issues aren't known. These are not subjects he tweets about. Commendably, Tesla has announced it will pay travel costs for employees in Texas to travel out of state for healthcare – restrictions on abortion are severe in the state.⁶⁵ Musk has, though, recently declared that he would vote for Republican Florida Governor De Santis for President, if he should run in 2024.⁶⁶ Following the Supreme Court's overturning of Roe v Wade in June 2022, the Governor has pushed hard for very strong restrictions on abortion in his state.⁶⁷ Similarly, whether Musk was sensitive to the optics of being "honored"⁶⁸ to meet the world's most high– profile anti-abortion advocate and opponent of contraception, Pope Francis, just days after the judgement isn't known. It is certainly the case that @Pontifex shares Musk's view on population, having described the childfree as selfish⁶⁹ and spoken of Italy's demographic winter in recent months.⁷⁰

As for the Sustainable Development Goals, despite great progress made in terms of human health and wellbeing in recent decades, the UN's latest report describes them as being "off track",⁷¹ a euphemism that disguises a human price that even those of us living comfortably in the global top 10%, never mind the world's richest man, can scarcely imagine.

So far, no apparent outcome has resulted from Musk's high profile "offer" to sell \$6bn Tesla shares and donate it to the UN if it could be shown to his satisfaction it would end world hunger.⁷² (Though it is possible he *did* liquidate a thirtieth of his assets to make that donation.⁷³)

THIS WAY TO GILEAD

Fear of demographic decline can lead to more direct actions than a failure to invest in or promote the positive actions that empower people to choose smaller families. The authors of the IHME report addressed a critical risk directly:

"A very real danger exists that, in the face of declining population, some states might consider adopting policies that restrict female reproductive health rights and access to services. Low fertility in these settings might become a major challenge to progress for females' freedom and rights."74

There is, however, no "might" here. It is already happening. Iran has introduced severe restrictions on family planning to directly address its falling birth rate.⁷⁵ In the light of the well-publicised negative demographic consequences of its notorious one-child policy the Chinese Communist Party, previously the poster child of population "control", is making access to abortion and vasectomy more difficult and vilifying women who do not serve their country by filling the baby "shortage" their own policy has created.⁷⁶ In Eastern Europe, populist and demagogues are simultaneously calling for more native babies to stave off the supposed threat of immigration and multiculturalism and making abortion more difficult (in Poland's case, almost impossible) to obtain.⁷⁷ In the UK, in the week of writing this section, a proposal has been mooted that the childfree should face extra taxation.⁷⁸ In the US, some anti-abortion advocates have not been shy in linking the country's low birth rate and Roe v Wade.⁷⁹

It is precisely in areas such as this that Musk's hyperbole and generalisations are so dangerous. While there is no suggestion he favours coercive measures, his rhetoric may embolden those who do. He has an almost unique position – a man of the people, able to engender popular panic about a baby bust through Twitter and his ubiquity in traditional media, and at the same time a man whose billions ensure his views are known in the corridors of power.

His descriptions of the belief that having fewer kids will help the environment as "total nonsense" and a "mind-virussy thing" certainly stigmatise those who believe exactly that – up to a third of young people in the UK according to a 2021 Population Matters poll.⁸⁰

WHICH PLANET IS HE ON?

Reducing fertility and birth rates are important. Some countries face genuine depopulation challenges now, and all countries will in time be dealing with the consequences of having a higher proportion of older people. On an individual level, it is also true that economic and other circumstances lead some people to have fewer children than they would choose.

These issues demand informed and evidenced debate – not opinions and the occasional screengrab of a line graph. All of the expert bodies making projections recognise and discuss the implications of the numbers and scenarios they propose, good and bad. But much of the public debate has an air of 'first world problems' about it. Instead of worrying about biodiversity collapse, desertification or drought, the concerns raised are the impacts on pension expenditure and GDP. Instead of considering the way population growth and large family size can trap countries and families in poverty, the concern is raised that those of us who are, in relative terms, rich may become less rich. Instead of thinking about the hundreds of millions who are currently unable to exercise choice over the number of children they have, it frets over the number that people with plenty of options choose to have.

Elon Musk soars above these concerns. With his eyes fixed on the stars, he draws our attention to the threat posed by the expansion of the sun and tweets his 100 million followers about a problem most of us never knew we had: "If there aren't enough people for Earth, then there definitely won't be enough for Mars [sad face]"(3,600 retweets, 56,000 likes).⁸¹

That is his right. The rest of us must do better.

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GLOSSARY

Birth rate – Number of births over a given period divided by the person-years lived by the population over that period. It is expressed as average annual number of births per 1,000 population.

Population Growth Rate – The number of people added to (or subtracted from) a population in a year due to natural increase (and net migration where relevant), expressed as a percentage of the population at the beginning of the time period. **Replacement rate** – The total fertility rate (see below) at which a population exactly replaces itself from one generation to the next. The rate is roughly 2.1 children per woman, although it may vary with mortality rates.

Total Fertility Rate – The average number of children born to each woman over her lifetime if she were to live to the end of her child-bearing years. This approximates to family size and is the metric used most commonly by demographers and health professionals.

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ABOUT POPULATION MATTERS

Population Matters is a UK-based charity which campaigns to achieve a sustainable human population, to protect the natural world and improve people's lives. We promote positive, practical, ethical solutions – encouraging smaller families, inspiring people to consume sustainably, and helping us all to live within our planet's natural limits. We believe everyone should have the freedom and ability to choose a smaller family. We are committed to human rights, women's empowerment and global justice.



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